

## Math 175 Practice Placement Exam

**Problem 1.** On which intervals is the function  $f(x) = x^2 - 8x + 15$  non-negative?

- (a) All real numbers.
  - (b)  $[3, 5]$
  - (c)  $[0, \infty)$
  - (d)  $(-\infty, 3] \cup [5, \infty)$
  - (e) None of the above.
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**Problem 2.** Which of the following functions are even?

- (a)  $x \sin x$
  - (b)  $x^2 + 4$
  - (c)  $\cos 2x$
  - (d) All of the above.
  - (e) None of the above.
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**Problem 3.** If  $f(x) = \frac{1}{x}$  and  $g(x) = |x + 1|$ , then  $(f \circ g)(-4) =$

- (a)  $\frac{3}{4}$
  - (b)  $\frac{1}{5}$
  - (c)  $\frac{1}{3}$
  - (d)  $\frac{4}{3}$
  - (e) None of the above.
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**Problem 4.** Find the limit:  $\lim_{x \rightarrow -2^-} \frac{2x - 1}{x(x + 2)} =$

- (a) 0
  - (b) -1
  - (c)  $-\infty$
  - (d)  $+\infty$
  - (e) None of the above.
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**Problem 5.** Find the limit:  $\lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{x^2 - 7x + 12} =$

- (a) 0
  - (b)  $-4$
  - (c) 1
  - (d) Limit does not exist.
  - (e) None of the above.
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**Problem 6.** Find the equation of the tangent line to  $y = x^3 - x^2 + 1$  at the point  $(-1, -1)$ .

- (a)  $y = x$
  - (b)  $y = 5x + 4$
  - (c)  $y = 5x - 4$
  - (d)  $y = 3x^2 - 2x$
  - (e) None of the above.
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**Problem 7.** Find the derivative of  $f(x) = \frac{x+1}{x+2}$ .

- (a)  $f'(x) = \frac{x+2}{x+1}$
  - (b)  $f'(x) = 1$
  - (c)  $f'(x) = \frac{1}{(x+2)^2}$
  - (d)  $f'(x) = \frac{x+1}{(x+2)^2}$
  - (e) None of the above.
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**Problem 8.** Find the derivative of  $g(x) = (x^2 + 5x + 1)^7$ .

- (a)  $g'(x) = 7(2x + 5)^6$
  - (b)  $g'(x) = 7(2x + 5)(x^2 + 5x + 1)^6$
  - (c)  $g'(x) = \frac{1}{6}(x^2 + 5x + 1)^8$
  - (d)  $g'(x) = 7(2x + 5)(x^2 + 5x + 1)^7$
  - (e) None of the above.
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**Problem 9.** Find the derivative of  $g(\theta) = \sin \theta \cos \theta$ .

- (a)  $g'(x) = \cos^2 \theta - \sin^2 \theta$
  - (b)  $g'(x) = \sin^2 \theta - \cos^2 \theta$
  - (c)  $g'(x) = -\cos \theta \sin \theta$
  - (d)  $g'(x) = \cos \theta - \sin \theta$
  - (e) None of the above.
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**Problem 10.** If a particle's position at time  $t$  is given by  $s(t) = 5t^2 + 7t + 10$ , when is the velocity of the particle equal to 12?

- (a)  $t = 127$
  - (b)  $t = \frac{1}{2}$
  - (c)  $t = 5$
  - (d)  $t = 12$
  - (e) None of the above.
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**Problem 11.** Find the derivative of  $f(x) = \sec^2 x$ .

- (a)  $f'(x) = \sec^2 x$
  - (b)  $f'(x) = \tan^2 x$
  - (c)  $f'(x) = 2 \sec^2 x \tan x$
  - (d)  $f'(x) = 2 \sec x \tan x$
  - (e) None of the above.
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**Problem 12.** Find the limit:  $\lim_{x \rightarrow 0} \frac{\sin 5x}{2x}$

- (a)  $\frac{5}{2}$
  - (b) 1
  - (c)  $\frac{2}{5}$
  - (d) The limit does not exist.
  - (e) None of the above.
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**Problem 13.** Find  $dy/dx$  if  $1 + x^2y = y^3$ :

- (a)  $dy/dx = 2x/(3y^2)$
  - (b)  $dy/dx = (1 + 2xy)/(3y^2 - x^2)$
  - (c)  $dy/dx = (2xy)/(3y^2 - x^2)$
  - (d)  $dy/dx = (2xy)/(x^2 - 3y^2)$
  - (e) None of the above.
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**Problem 14.** Find the second derivative of  $F(x) = x - \frac{1}{x}$ :

- (a)  $F''(x) = x - x^{-1}$
  - (b)  $F''(x) = 1 - \frac{1}{x^2}$
  - (c)  $F''(x) = -\frac{1}{x^3}$
  - (d)  $F''(x) = \frac{2}{x^3}$
  - (e) None of the above.
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**Problem 15.** If  $y = 5 - x^2$  and  $dy/dt = -12$ , find  $dx/dt$  when  $x = 2$ .

- (a) 1
  - (b) 2
  - (c) 3
  - (d) -12
  - (e) None of the above.
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**Problem 16.** Find the linearization  $L(x)$  of  $f(x) = \sqrt{x+1}$  at the point  $x = 3$ .

- (a)  $L(x) = \frac{1}{4}$
  - (b)  $L(x) = 2x$
  - (c)  $L(x) = \frac{1}{4}x - \frac{5}{4}$
  - (d)  $L(x) = \frac{1}{4}x + \frac{5}{4}$
  - (e) None of the above.
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**Problem 17.** Find the critical numbers of  $f(x) = 2x^3 - 9x^2 - 60x + 4$ .

- (a)  $\{-5, 2\}$
  - (b)  $\{-5, -2\}$
  - (c)  $\{5, 2\}$
  - (d)  $\{5, -2\}$
  - (e) None of the above.
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**Problem 18.** Find the interval(s) on which  $f(t) = 3t^4 - 8t^3 - 18t^2 + 10$  is increasing.

- (a)  $(-1, 0) \cup (3, \infty)$
  - (b)  $(-\infty, -1) \cup (0, 3)$
  - (c)  $(-1, 3)$
  - (d)  $(-\infty, -1) \cup (3, \infty)$
  - (e) None of the above.
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**Problem 19.** At which of the following values of  $x$  is  $f(x) = 2 \cos x - x$  concave up?

- (a)  $x = 0$
  - (b)  $x = \frac{\pi}{4}$
  - (c)  $x = \frac{\pi}{3}$
  - (d) All of the above.
  - (e) None of the above.
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**Problem 20.** Find an antiderivative of the function  $g(x) = \sqrt[3]{x}(4 - 7x)$ .

- (a)  $x^{4/3} - x^{7/3}$
  - (b)  $4x^{4/3} - 7x^{7/3}$
  - (c)  $7x^{4/3} - 4x^{7/3}$
  - (d) All of the above.
  - (e) None of the above.
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**Problem 21.** Which of the following expressions are equivalent to  $\frac{\sin 3x}{\sin 2x}$ ?

- (a)  $\sin x$
  - (b)  $\sin \frac{3}{2}x$
  - (c)  $\frac{3 \cos^2 x - \sin^2 x}{2 \cos x}$
  - (d)  $2 \cos x + \frac{1}{2 \cos x}$
  - (e) None of the above.
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**Problem 22.** Find the derivative of  $f(x) = \int_1^{x^2} \tan t \, dt$ .

- (a)  $f'(x) = 2x \tan x^2$
  - (b)  $f'(x) = \sec^2 x^2$
  - (c)  $f'(x) = \tan 2x$
  - (d)  $f'(x) = 2x \sec^2 x^2$
  - (e) None of the above.
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**Problem 23.** Find:  $\int x \cos x^2 \, dx$ .

- (a)  $\sin x^2 + C$
  - (b)  $\frac{x^2}{2} \sin x^2 + C$
  - (c)  $\cos x^2 - 2x^2 \sin x^2 + C$
  - (d)  $\cos x^2 + C$
  - (e) None of the above.
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**Problem 24.** Find:  $\int_0^1 x^2(x^3 + 1)^4 \, dx$ .

- (a)  $31/15$
  - (b)  $32/15$
  - (c)  $31/5$
  - (d)  $31/3$
  - (e) None of the above.
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**Problem 25.** Find the area under the curve  $f(x) = \frac{1}{x^2}$  between  $x = 2$  and  $x = 3$ .

- (a)  $1/3$
- (b)  $-1/4$
- (c)  $1/5$
- (d)  $1/6$
- (e) None of the above.

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**Answers to Practice Placement Test**